

# NETWORK SERVICE SECURITY THROUGH SOFTWARE DEFINED NETWORKING

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# Overview

- Introduction
- Test Method and Materials
- Results
- Conclusion
- Future Work
- Questions



# Software Defined Networking

- Separate the data plane and the control plane
- Software layer between hardware and admin
- Virtual networks within a physical network



# OpenFlow

- ⦿ Open source SDN
- ⦿ Hardware management on a single platform
- ⦿ Exploits a common set of functions found on most switches
- ⦿ OpenFlow Protocol
  - Flow table
  - Actions

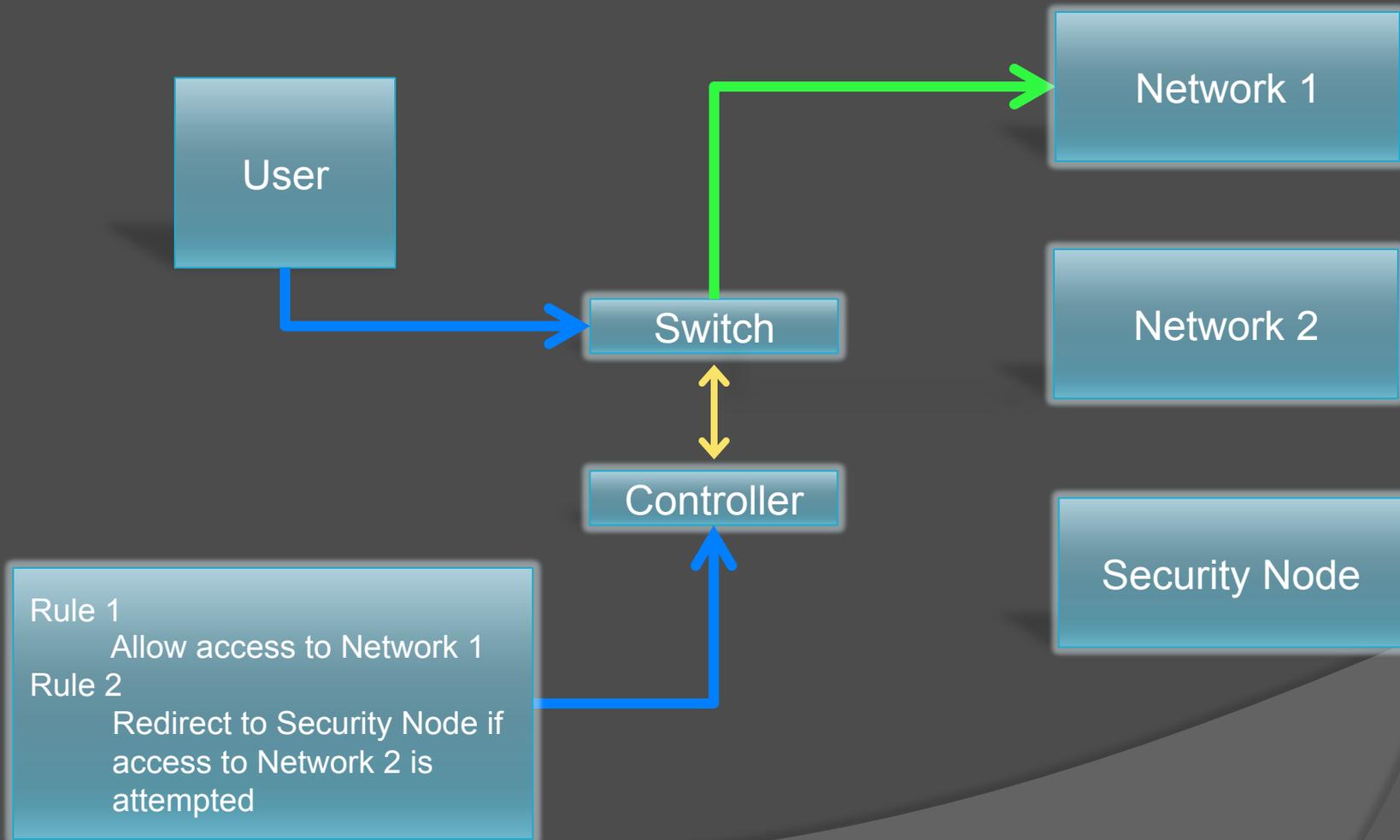


# Controller

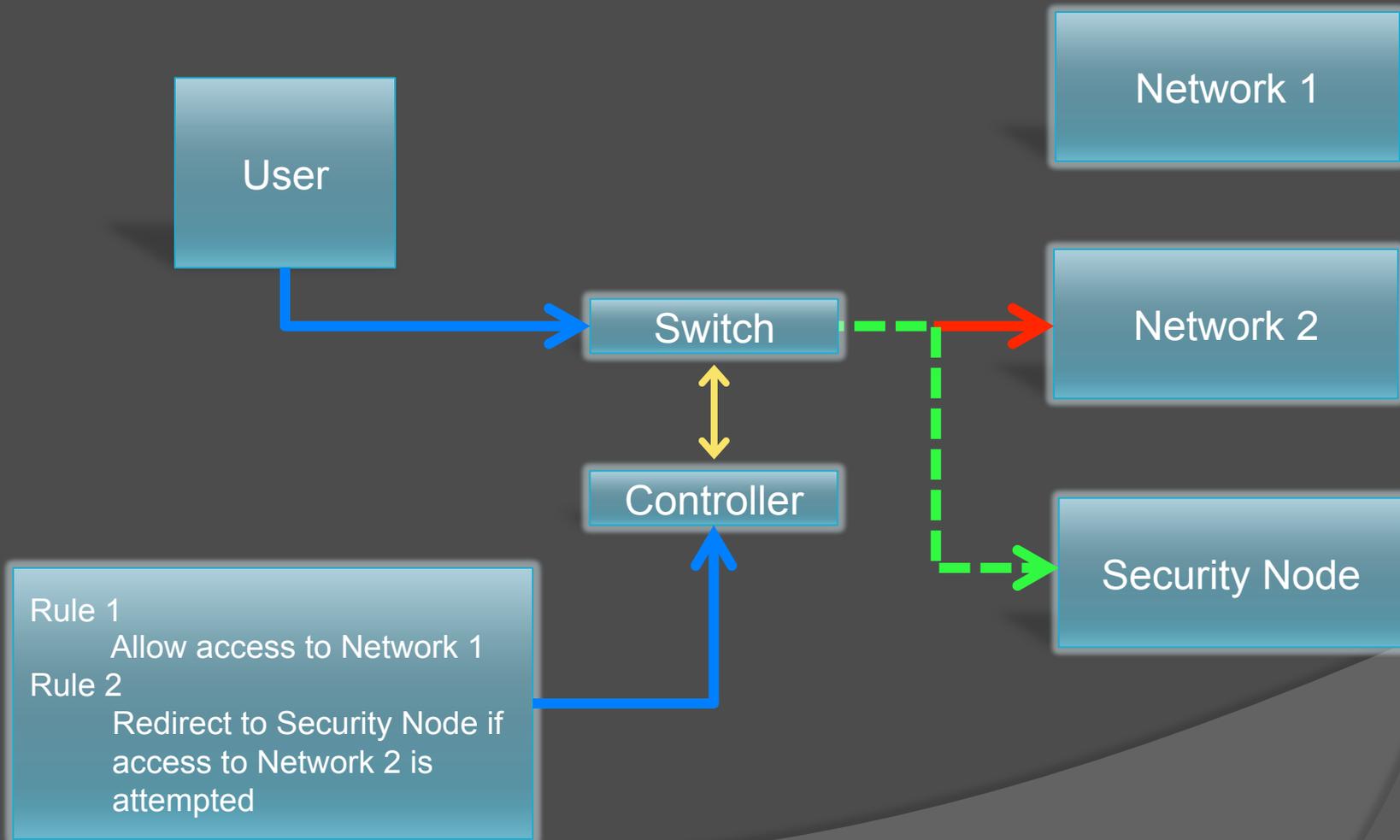
- ⦿ Management software for network
- ⦿ Communicates via a secure channel
- ⦿ Push and remove flows
- ⦿ Determine actions for undefined flows



# Networks for Security



# Networks for Security



Melanie Palmer

# Materials and Test Methods



# Objective

- Performance
- Reliability
- Scalability



# Materials

- ◎ Our Cluster
  - Seven node
  - CentOS 6.4
- ◎ Arista 7050S
  - OpenFlow 1.0
  - EOS 4.10.4
- ◎ Floodlight 0.9
  - Open source
  - Widely used in industry
  - Java based



# Test Suite

- ⦿ Load Test
  - Performance
  - Reliability

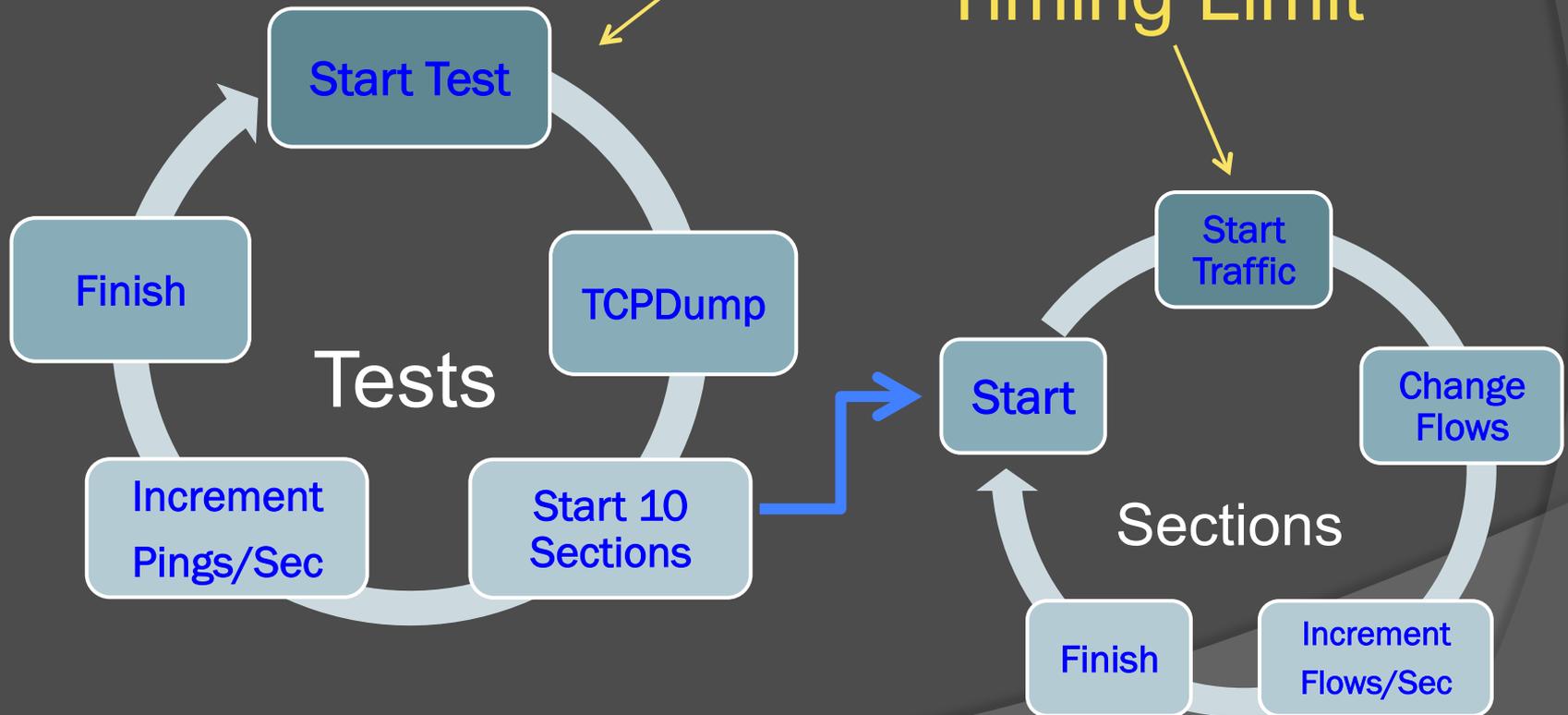


# Test Suite

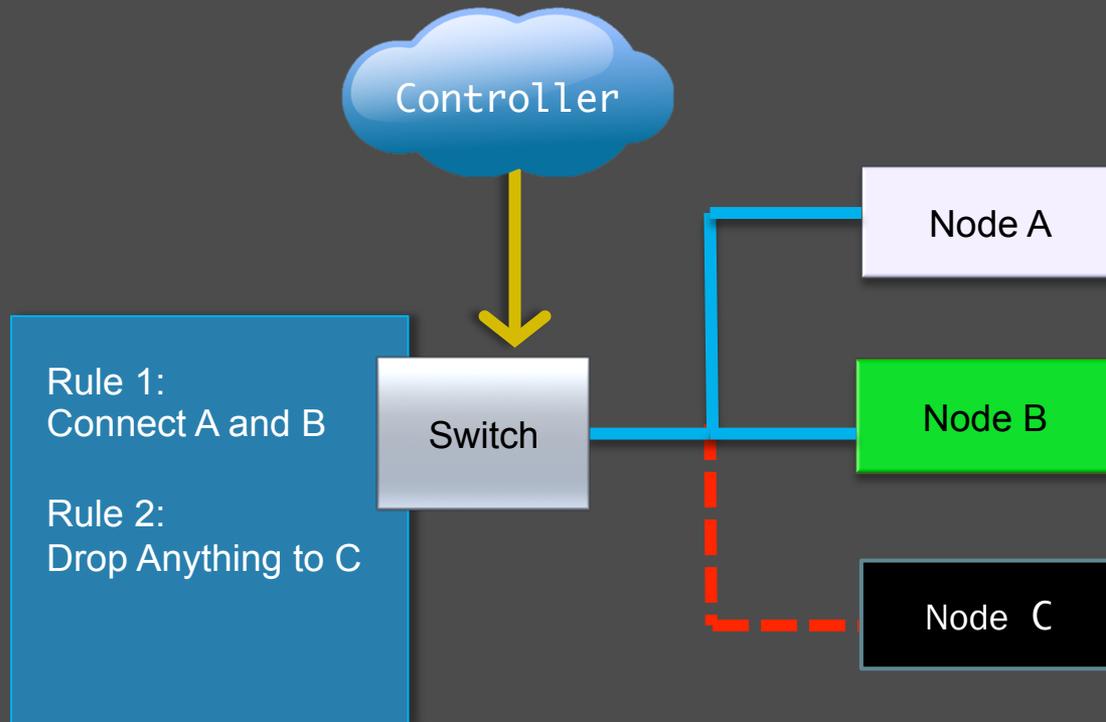
- Load Test

Traffic Limit

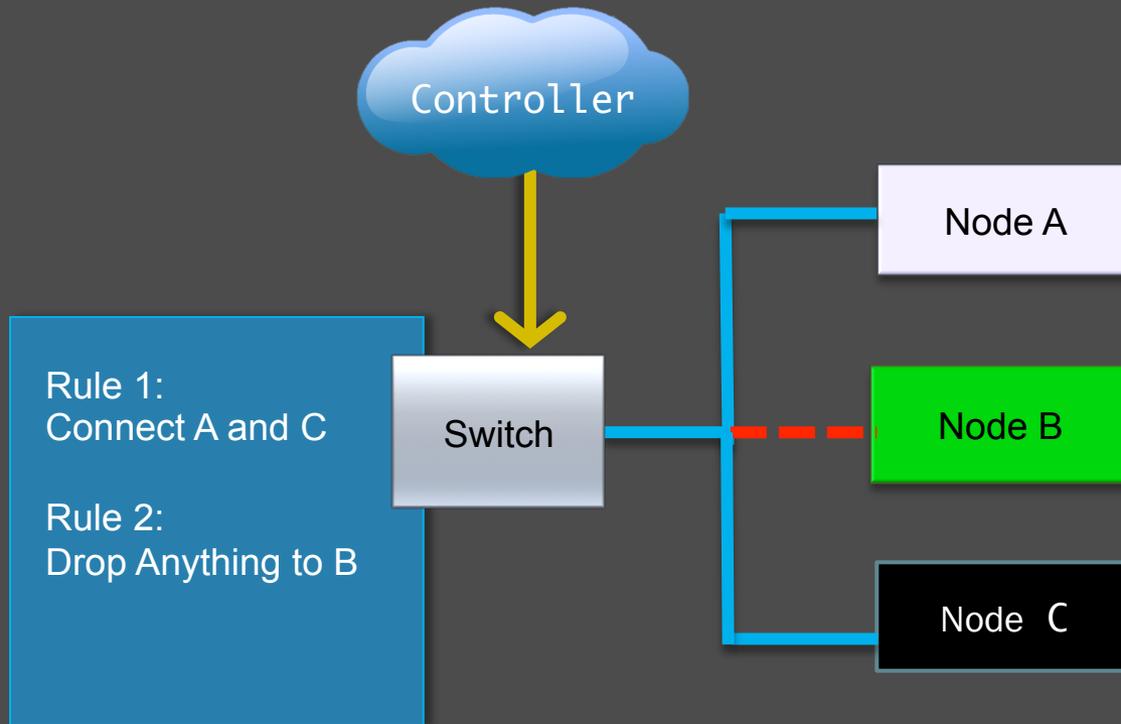
Timing Limit



# Load Test



# Load Test



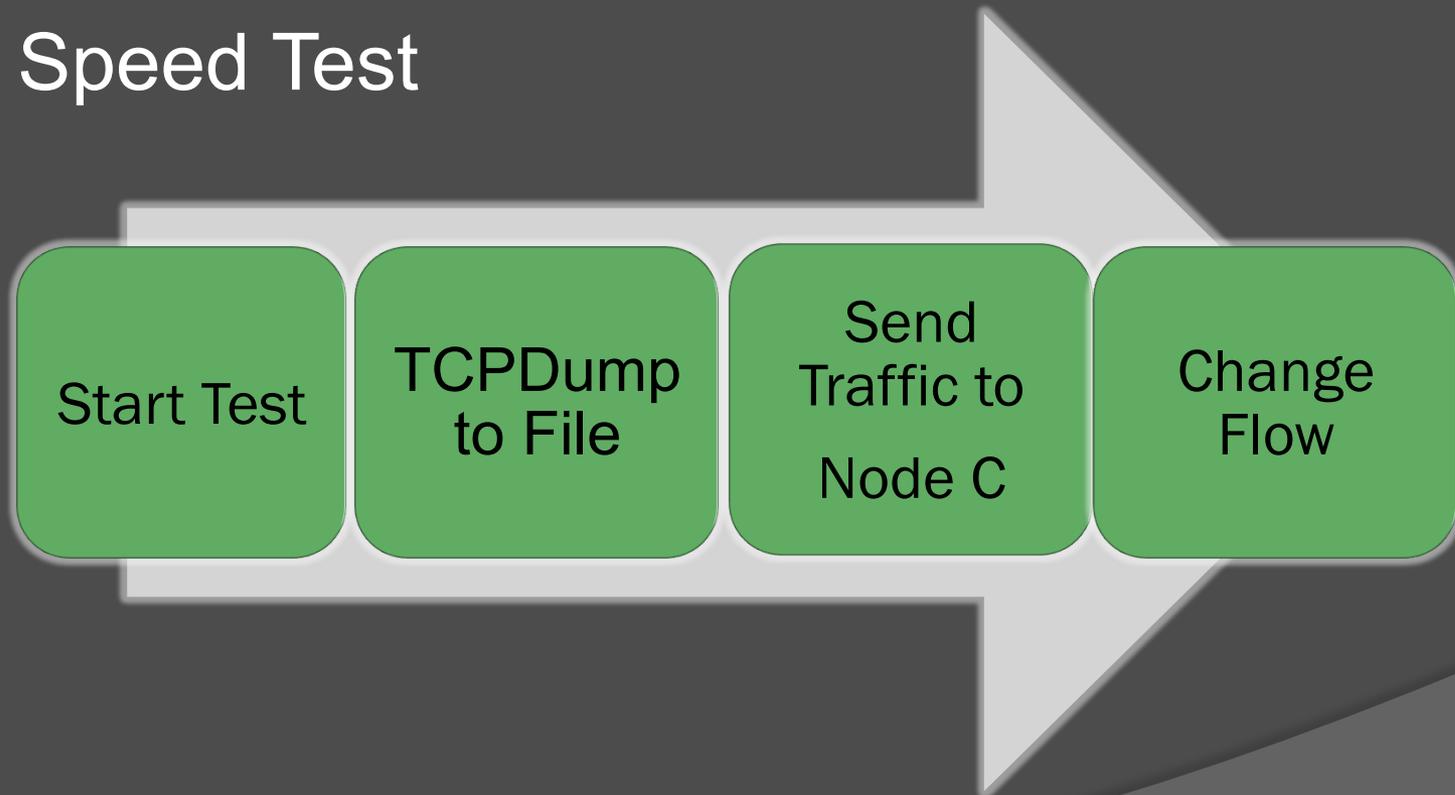
# Test Suite

- ⦿ Load Test
- ⦿ Speed Test
  - Scalability
  - Performance

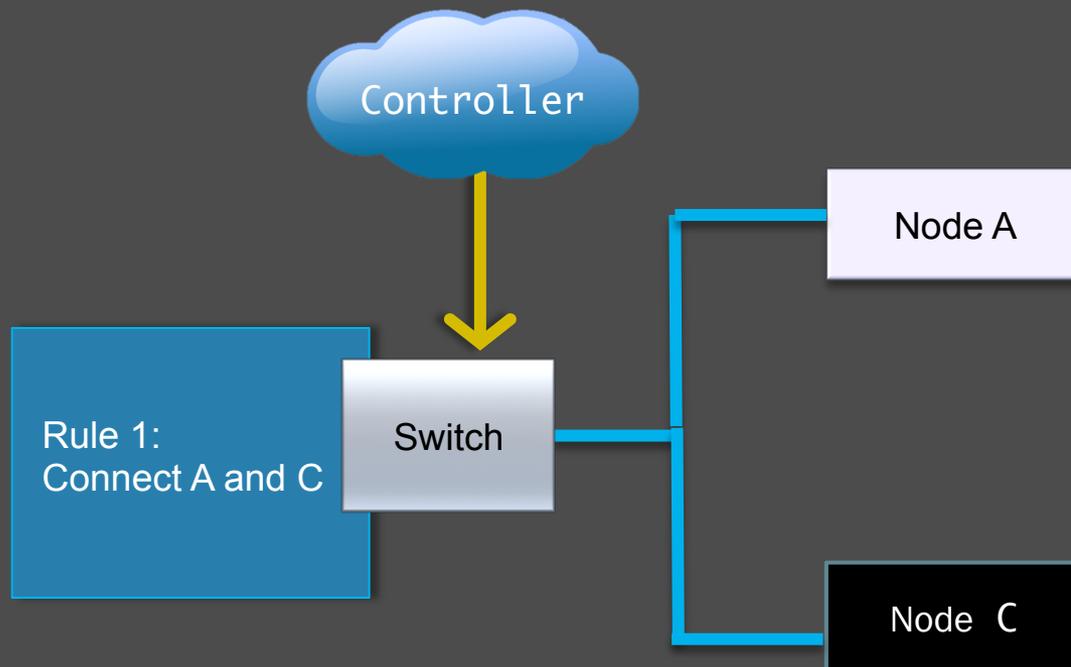


# Test Suite

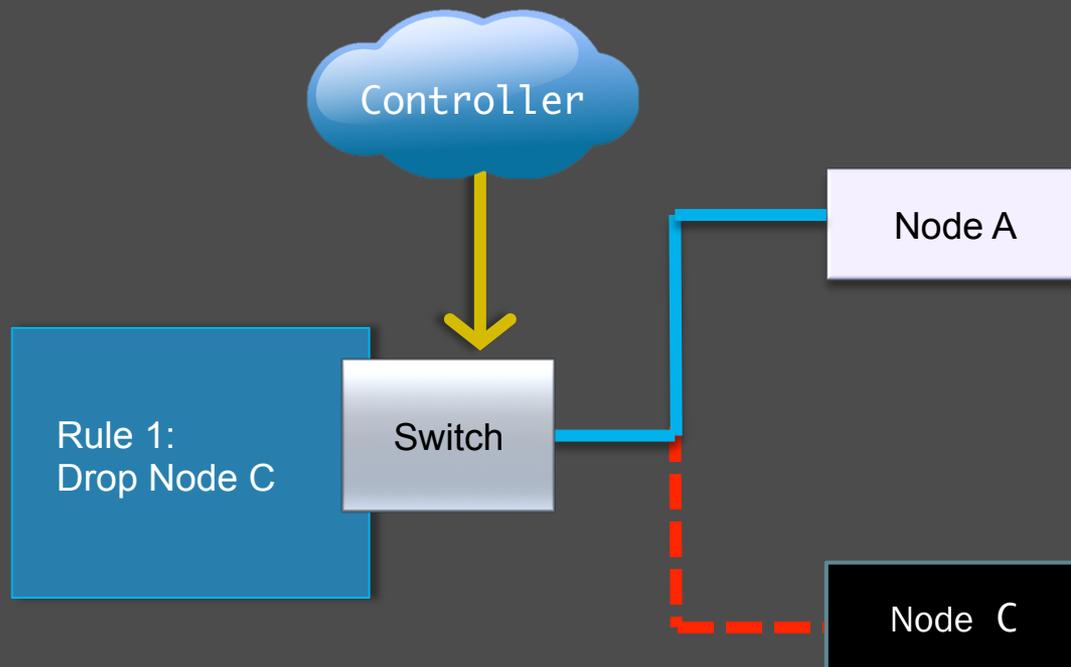
- Load Test
- Speed Test



# Speed Test

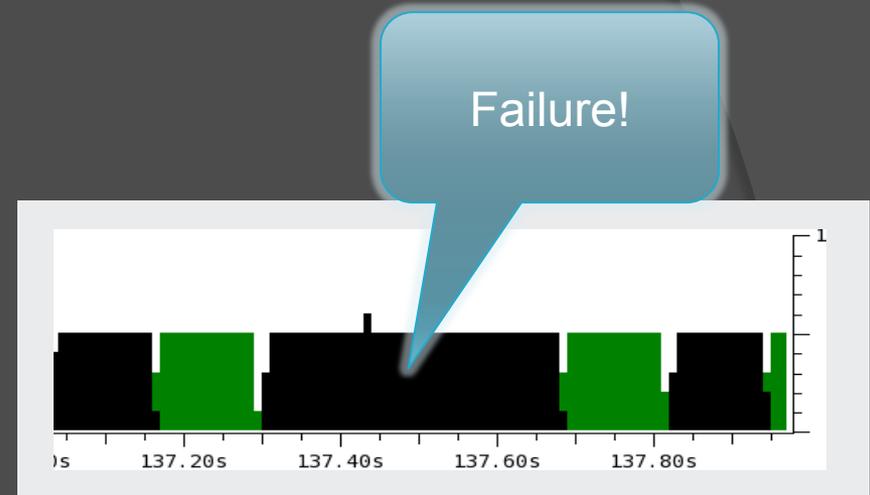


# Speed Test

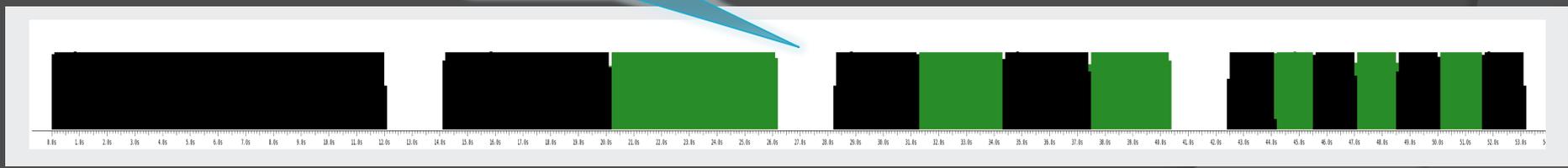


# Test Suite

- Load Test
- Speed Test
- Analysis Program

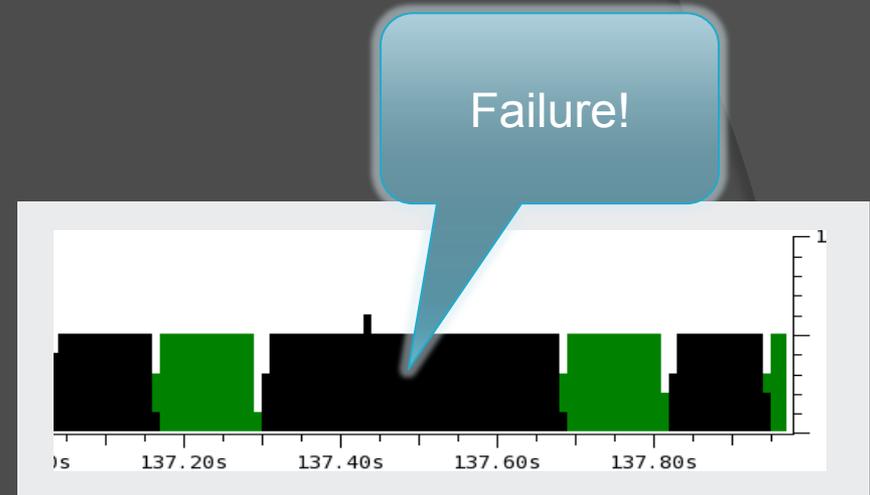


Expected Behavior



# Test Suite

- Load Test
- Speed Test
- Analysis Program
  - Stage 1 - Extracts
    - Error rate
    - Flow change speed
  - Stage 2 - Analyzes
    - Averages data
    - Standard deviations



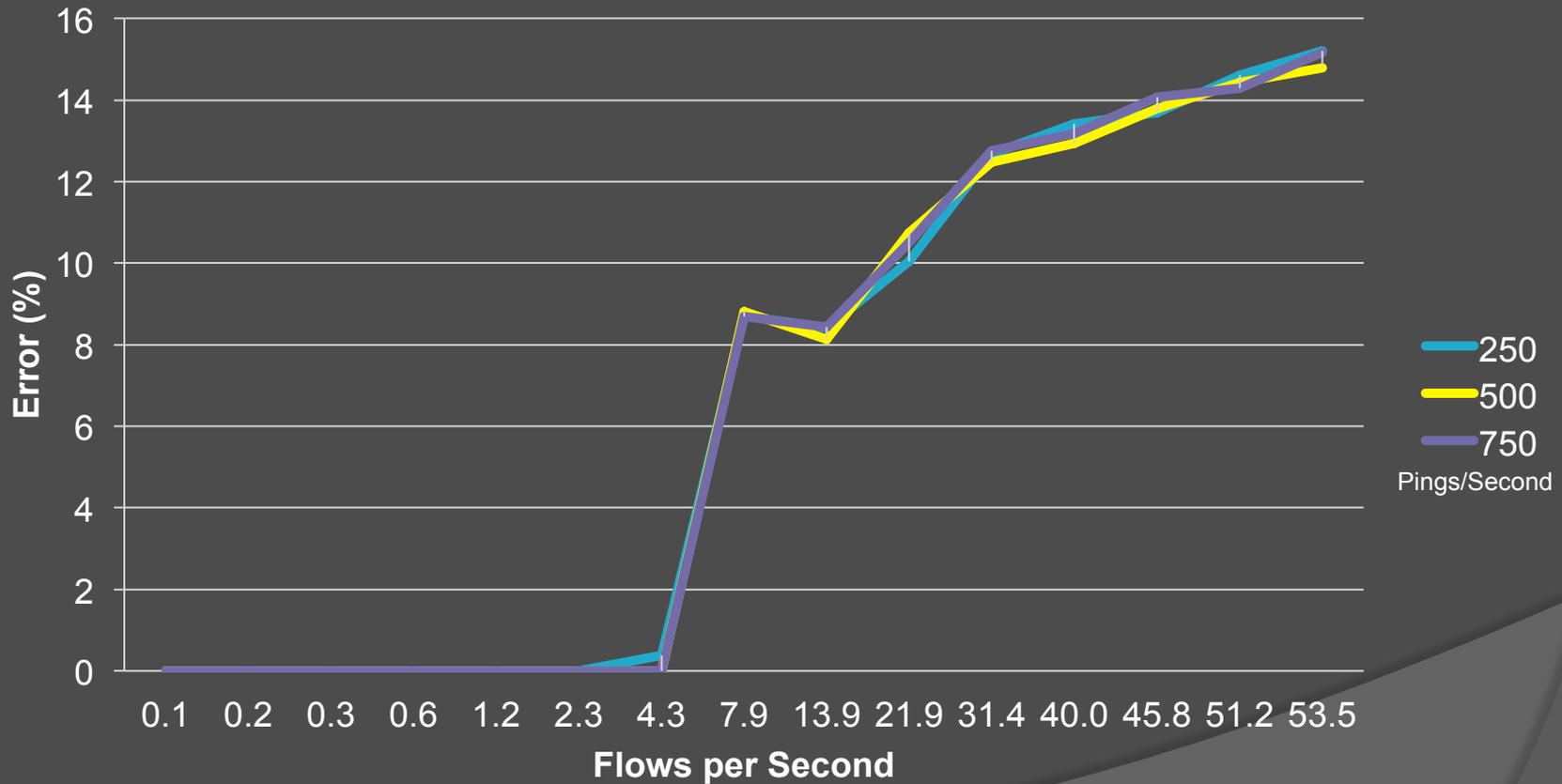
Rob Sullivan

# Results

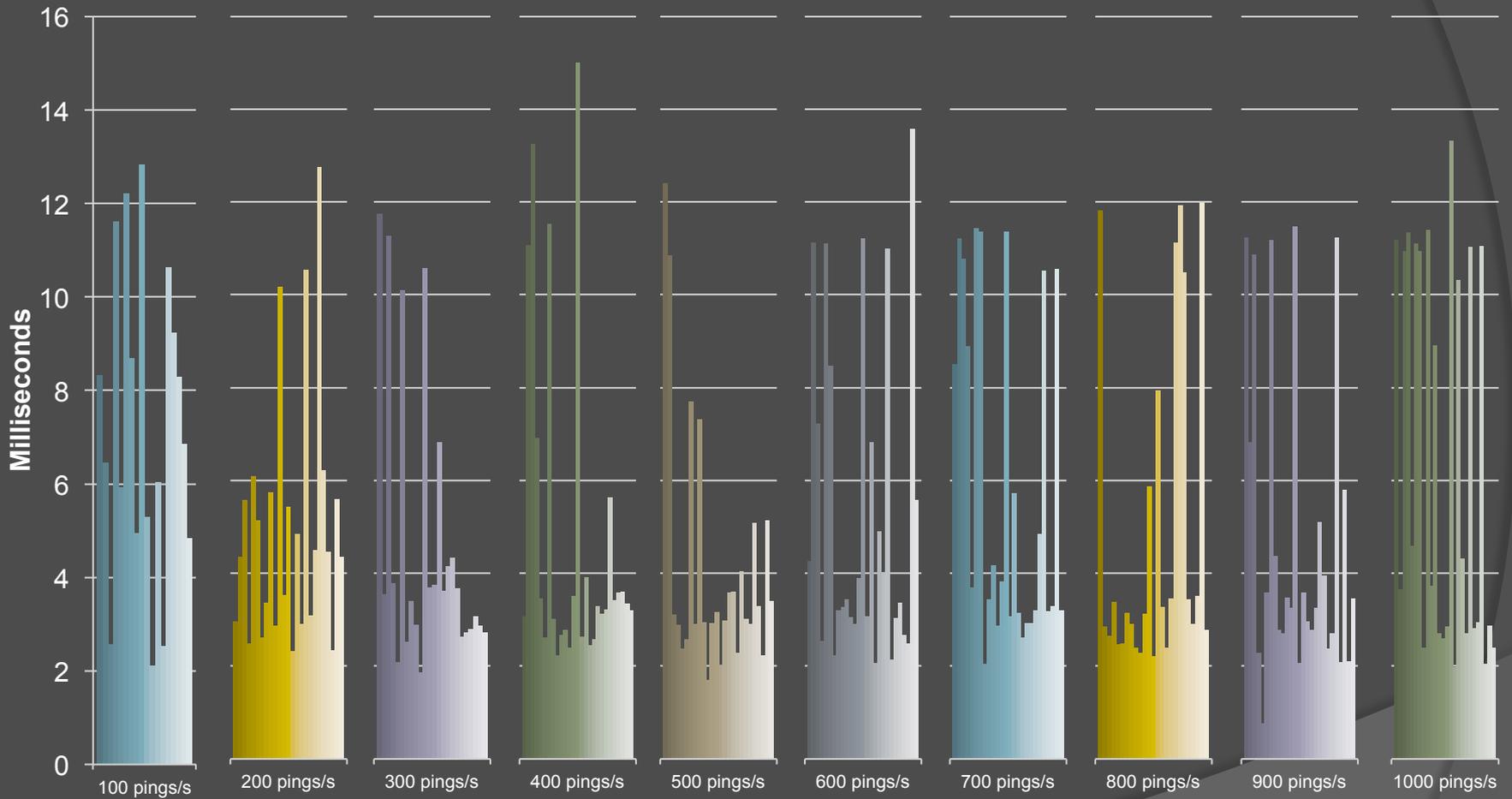


# Load Test Results

## Flow Push Error Rate



# Speed Test Results



# Problems

## Some We Overcame

- ⦿ OpenFlow 1.0
- ⦿ Volume and nature of data
- ⦿ Human error

## Some We Didn't

- ⦿ Imprecision of some test methods
- ⦿ Meaningful packet redirection



# Conclusion



# Will OpenFlow Work?

## Pro's

- ⦿ Allows software reconfiguration of networks
- ⦿ Easy administration
- ⦿ Flows can be reliably pushed up to a measurable rate
- ⦿ Flow push failure is low even at high push rates

## Con's

- ⦿ OpenFlow v. 1.0 inadequacies
- ⦿ Hardware specific limits
- ⦿ Potential security issues
- ⦿ Controller can get overwhelmed



# Future Work

- OpenFlow 1.1
- Security
- Controllers and hardware
- Scale



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New Mexico Institute of Mining and Technology

Michigan Technological University

Your turn!

Questions?

